DSC2144FI2-F0022

Crystal-less™ Configurable Clock Generator

General Description

The DSC2144FI2-F0022 is a programmable, high performance dual HCSL output oscillator utilizing Microchip's proven silicon MEMS technology to provide excellent jitter and stability while incorporating high output frequency flexibility.

The DSC2144FI2-F0022 allows the user to independently modify the frequency of each output using I2C interface.

The user can also select from two pre-programmed default output frequencies using the frequency select pin.

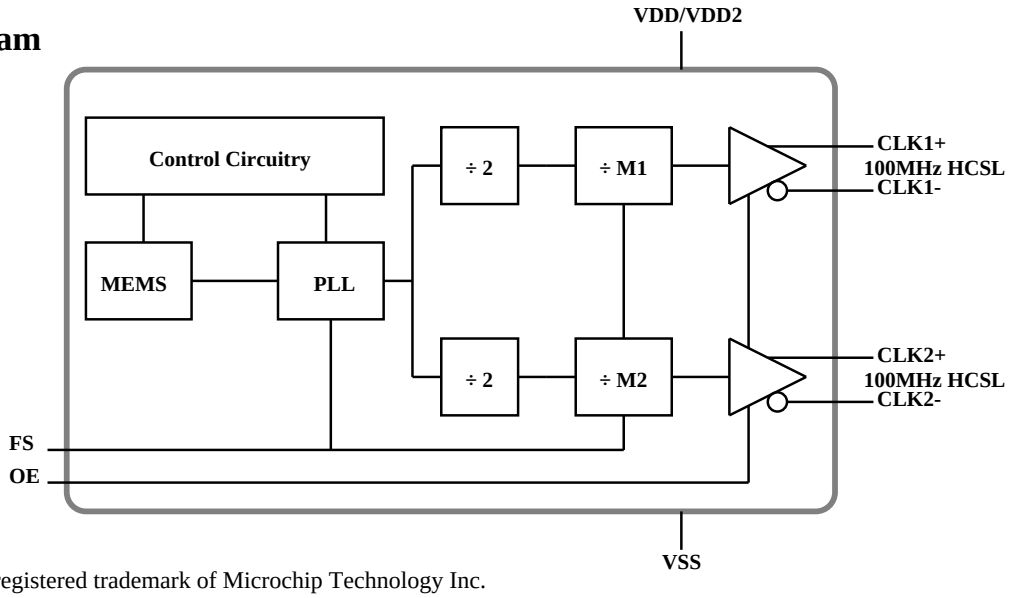
Applications

- Consumer Electronics
- Storage Area Networks
  - SATA, SAS, Fibre Channel
- Passive Optical Networks
  - EPON, 10G-EPON, GPON, 10G-GPON
- Ethernet
  - 1G, 10GBASE-T/KR/LR/SR, and FCoE
- HD/SD/SDI Video & Surveillance
- PCI Express
- Automotive

Features

- Frequency and output formats:
  - HCSL
    100MHz
  - HCSL
    100MHz
- Low RMS phase jitter: <1ps (typ)
- ±25ppm frequency stability
- -40°C to +85°C industrial temperature range
- High supply noise rejection: -50dBc
- I2C programmable frequencies
- Excellent shock & vibration immunity
  - Qualified to MIL-STD-883
- High reliability
  - 20x better MTF than quartz oscillators
- Supply range of 2.25 to 3.6V
- 14-pin 3.2mm x 2.5mm QFN package

Block Diagram

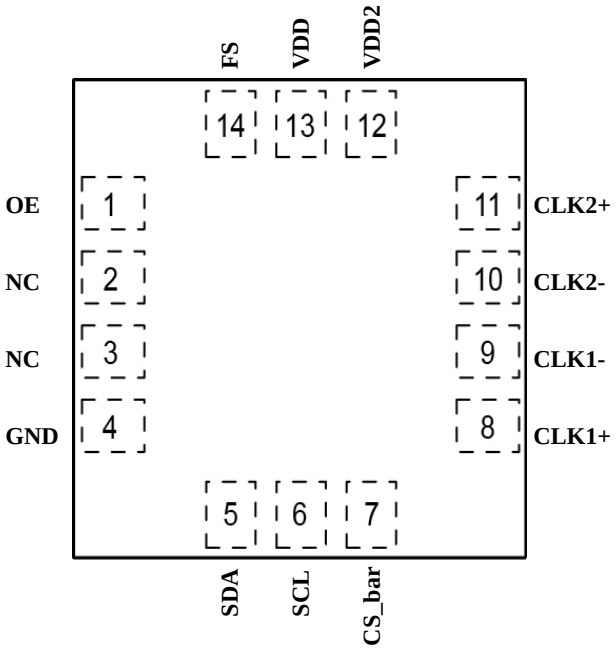


Ordering Information

Ordering Part Number	Industrial Temperature Range	Shipping	Package
DSC2144FI2-F0022	-40°C to +85°C	Tube	14-pin 3.2mm x 2.5mm QFN
DSC2144FI2-F0022T	-40°C to +85°C	Tape and Reel	14-pin 3.2mm x 2.5mm QFN

Devices are Green and RoHS compliant. Sample material may have only a partial top mark.

Pin Configuration



14-pin 3.2mm x 2.5mm QFN

Pin Description

Pin Number	Pin Name	Pin Type	Pin Function
1	OE	I	Enables outputs when high and disables outputs when low
2	NC		Leave unconnected or connect to ground
3	NC		Leave unconnected or connect to ground
4	GND	PWR	Ground
5	SDA	I	I2C serial data
6	SCL	I	I2C serial clock
7	CS_bar	I	I2C chip select (active low)
8	CLK1+	O	Positive HCSL output
9	CLK1-	O	Negative HCSL output
10	CLK2-	O	Negative HCSL output
11	CLK2+	O	Positive HCSL output
12	VDD2	PWR	Power supply for HCSL output CLK2, 1.65V to 3.6V (VDD2 ≤ VDD)
13	VDD	PWR	Power supply
14	FS	I	Frequency select pin, see Table 1 for details

Operational Description

The DSC2144FI2-F0022 is a dual output HCSL oscillator consisting of a MEMS resonator and a supporting PLL IC. The two HCSL outputs are generated through independent 8-bit programmable dividers from the output of the internal PLL. DSC2144FI2-F0022 allows for easy programming of theoutput frequencies using I2C interface. Upon power-up, the output frequencies are controlled by an internal pre-programmed memory (OTP). This memory stores all coefficients required by the PLL for two different default frequency pairs. The control pin (FS) selects the initial pair. Once the device is powered up, a new output frequency pair can be programmed using I2C pins. Programming details are provided in the Programming Guide.

When OE (pin 1) is floated or connected to VDD, the DSC2144FI2-F0022 is in operational mode. Driving OE to ground will disable both output drivers (hi-impedance mode).

Output Clock Frequencies

Frequency select bits are weakly tied high so if left unconnected the default setting will be [1] and the device will output the associated frequency highlighted in bold.

Freq (MHz)	Freq Select Bit [FS] - Default is [1]	
	0	**1**
CLK1	NA	**100**
CLK2	NA	**100**

Table 1. Pin-Selectable Output Frequencies

Absolute Maximum Ratings

Item	Min.	Max.	Units	Condition
Supply Voltage	-0.3	+4.0	V	
Input Voltage	-0.3	VDD + 0.3	V	
Junction Temp	-	+150	°C	
Storage Temp	-55	+150	°C	
Soldering Temp	-	+260	°C	40sec max.
ESD HBM MM CDM	-	 4000 400 1500	V	

1000+ years of data retention on internal memory

Specifications (Unless specified otherwise: T = 25°C)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Units
Supply Voltage[1]	VDD		2.25		3.6	V
Supply Current	IDD	OE pin low - output is disabled		21	23	mA
Supply Current[2]	IDD	OE pin high - outputs are enabled RL = 50Ohms, F01 = F02 = 156.25MHz		60		mA
Frequency Stability	△F	Includes frequency variation due to initial tolerance, temp. and power supply voltage			±25	ppm
Aging	△F	First year (@ 25°C)			±5	ppm
Startup Time[3]	tSU	T = 25°C			5	ms
Input Logic Levels Input Logic High Input Logic Low	 VIH VIL		 0.75 x VDD -		 - 0.25 x VDD	V
Output Disable Time[4]	tDA				5	ns
Output Enable Time[4]	tEN				20	ns
Pull-Up Resistor[2]		Pull-up exists on all digital IO		40		kOhms
HCSL Outputs						
Output Logic Levels Output Logic High Output Logic Low	 VOH VOL	RL = 50Ohms	 0.725 -		 - 0.1	V
Pk to Pk Output Swing		Single-Ended		750		mV
Output Transition Time[4] Rise Time Fall Time	 tR tF	 20% to 80% RL = 50Ohms, CL = 2pF	 200		 400	ps
Frequency	CLK1 CLK2	[FS] = [1]		100 100		MHz
Output Duty Cycle	SYM	Differential	48		52	%
Period Jitter[5]	JPER	F01 = F02 = 156.25MHz		2.8		psRMS
Integrated Phase Noise	JPH	200kHz to 20MHz @ 156.25MHz 100kHz to 20MHz @ 156.25MHz 12kHz to 20MHz @ 156.25MHz		0.25 0.37 1.7	 2	psRMS

Notes:

1. Pin 12 VDD2, and pin 13 VDD should be filtered with 0.1uF capacitors.
2. Output is enabled if OE pin is floated or not connected.
3. tSU is time to 100ppm stable output frequency after VDD is applied and outputs are enabled.
4. Output Waveform and Test Circuit figures below define the parameters.
5. Period Jitter includes crosstalk from adjacent output.

Nominal Performance Parameters (Unless specified otherwise: T = 25°C, VDD = 3.3V)

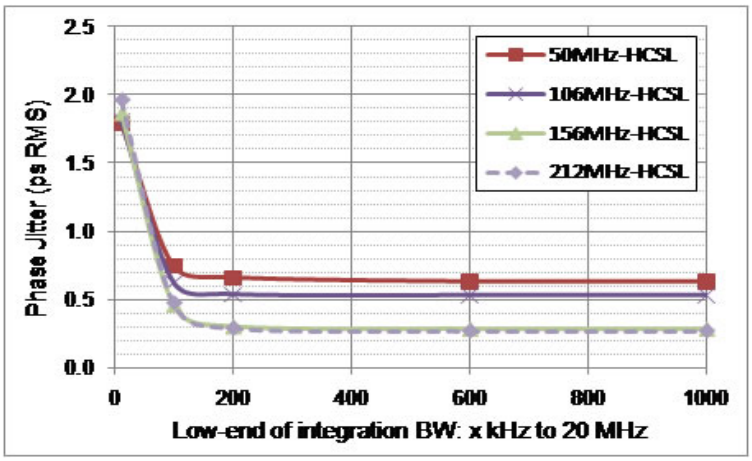


Figure 1. HCSL Phase Jitter (integrated phase noise)

HCSL Output Waveform

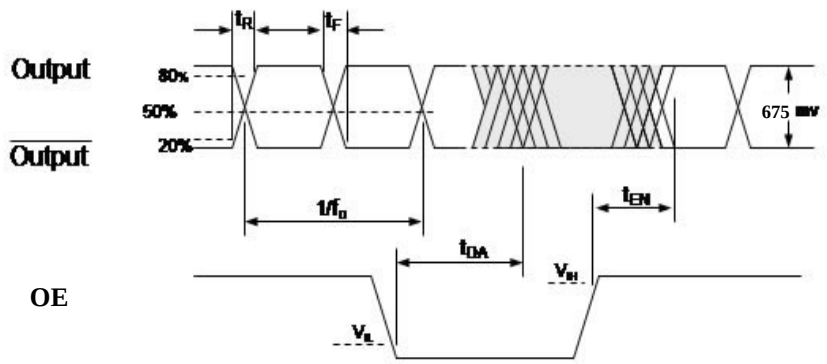


Figure 2. HCSL Output Waveform

MSL 1 @ 260°C refer to JSTD-020C	
Ramp-Up Rate (200°C to Peak Temp)	3°C/sec Max.
Preheat Time 150°C to 200°C	60 - 180 sec
Time maintained above 217°C	60 - 150 sec
Peak Temperature	255 - 260°C
Time within 5°C of actual Peak	20 - 40 sec
Ramp-Down Rate	6°C/sec Max.
Time 25°C to Peak Temperature	8 min Max.

Solder Reflow Profile

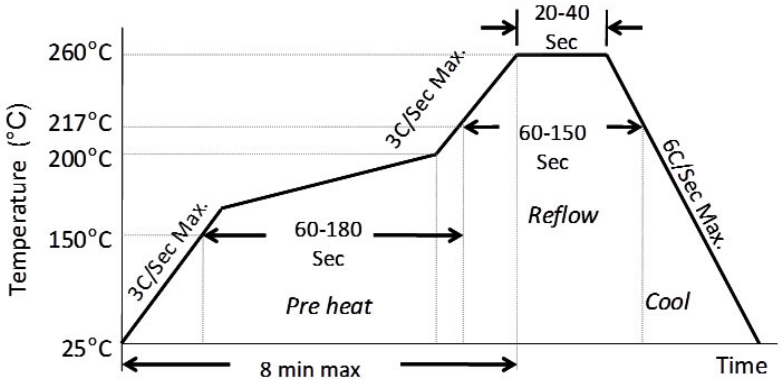
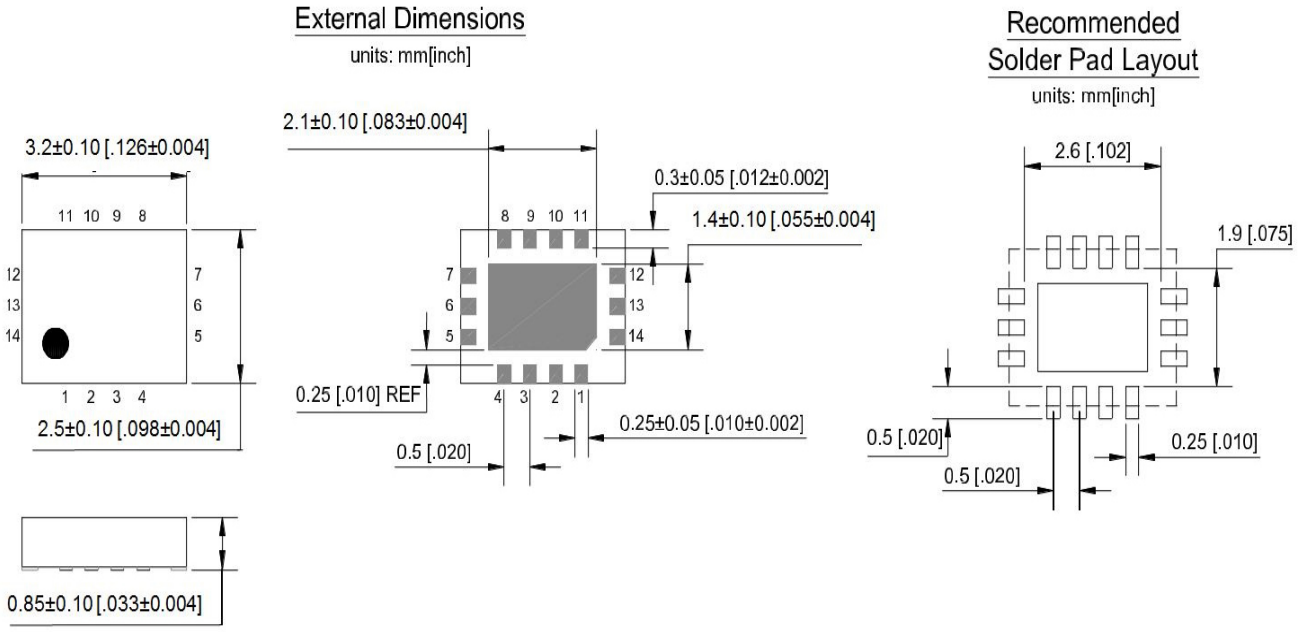


Figure 3. Solder Reflow Profile

Package Information[7]



3.2mm x 2.5mm 14 Lead Plastic Package

Notes:

6. Connect the exposed die paddle to ground.
7. Package information is correct as of the publication date. For updates and most current information, go to www.microchip.com.